Williams Ditch (Lake County)
Low Dissolved Oxygen and Impaired Biotic Community
Source Identification Study

August 2000

Surveys Section
Assessment Branch
Office of Water Quality
Indiana Department of Environmental Management
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By

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Surveys Section
Assessment Branch
Office of Water Quality
Indiana Department of Environmental Management
Indianapolis, Indiana
IDEM 032/02/069

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Tim Beckman of the Office of Water Quality Assessment Branch for equipment preparation and field activities assistance. Tim Bowren for providing QA/QC reports of all data. Cindy Martin created and provided the site map for the Williams Ditch watershed.

COVER PHOTO – 1999 Probabilistic Site near 125th Ave., facing upstream (East)

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Abstract

Williams Ditch is a man-made channelized ditch in southern Lake County which runs parallel to the Kankakee River and serves predominately to drain agricultural cropland to the north. A randomly selected sample site was located on Williams Ditch downstream of Shelby, Indiana during the 1999 Probabilistic Survey. Sampling results from the study indicated that Williams Ditch was impaired due to low Dissolved Oxygen levels, marginal fish community structure, and poor habitat. A follow-up Source ID study was conducted during the summer of 2000 to determine the extent of and identify the sources causing the impaired conditions. A total of three targeted sampling locations were chosen for this study, one site situated upstream and two sites situated downstream of the 1999 Probabilistic site. Findings from the Source ID study indicated natural conditions and anthropogenic impacts which have existed for over one hundred years are the primary sources of the impairments. Habitat destroyed by channelization, naturally flat topography, and an impoundment constructed for irrigation purposes have all combined to promote impaired conditions. Agricultural runoff serves to exacerbate algal growth in this low gradient stream. Excessive algal growth is one of the factors that produce depressed levels and wide diurnal fluctuations of Dissolved Oxygen. The low Dissolved Oxygen and mucky stream sediments caused by erosion and vegetative decay create extremely poor water quality conditions that will not support a healthy population of aquatic species.

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Introduction

Williams Ditch, also known as Dike Ditch, is a man-made channelized ditch in southern Lake County which runs parallel to the Kankakee River. This waterbody begins at Monon Road near the southern tip of the Town of Shelby, Indiana and flows in a southwestwardly direction to a confluence with the Kankakee River just across the Illinois State Line near the Town of Illiana Heights, Illinois. The reach of stream comprising the Williams Ditch study area drains a predominantly agricultural area to the north and a narrow strip of wooded wildlife area on the south which lies between the Kankakee River and Williams Ditch. All of the streams in this area of the Kankakee drainage basin have been channelized for the purpose of irrigation and surface water drainage control measures. Williams Ditch acts as the receiving stream for those channelized ditches that are unable to breech the Kankakee River levee.

1999 Watershed Survey

Williams Ditch was sampled as part of the Assessment Branch watershed program in 1999 (Christensen 2001). The randomly selected site was located just downstream of Whitcomb Road, west of Shelby. This site was sampled three times during the spring to fall field season of 1999 for water chemistry and once for biological data. The water chemistry sampling times were 9:15AM on May 26th, 9:30AM on July 14th and 2:20PM on September 14th. Field observations for Dissolved Oxygen indicated a relatively elevated level of 9.27 mg/L on May 26th, a severe stream standard violation of 1.27 mg/L on July 14th, and a marginally acceptable level of 4.77 mg/L on September 14th. The Indiana Stream Standard as listed at 327 IAC 2-1-6, states that concentrations of Dissolved Oxygen shall not be less than 4.0 mg/L at any time (IDEM 2000a). The severe stream standard violation occurred during a warm weather summer month and at a time of day which, when compared with other readings at this site, suggested a strong diurnal fluctuation in Dissolved Oxygen concentrations. There were no additional stream standard violations observed for these three sampling events.

The biological sampling was conducted in conjunction with the second water chemistry sampling event on July 14th. The Index of Biological Integrity (IBI) (Dufour 2002) scored a very marginal 32 out of a possible 60 for this sampling site. Some of the critical observations noted were the absence of darters, lack of headwater species and minnows, absence of sensitive species and simple spawners (Attachment I). These species depend upon highly oxygenated waters and a sandy substrate in order to thrive and maintain healthy popoulations.[1] Many of the fish species present had eroded fins. Fin erosion may be the result of abrasion or injury from overcrowding, malnutrition, high water pH, or the presence of a toxic substance (Post 1983). Habitat, which was evaluated by means of the Qualitative Habitat Evaluation Index (QHEI) (IDEM 1992), scored a very poor 33 out of a possible 100 (Attachment I) for this site due to poor substrate composition and poor riffle/run habitat. A QHEI of 51 or higher is considered a supportive habitat score for fish communities (IDEM 2002a).

2000 Source ID

Conditions such as channelization, prevalent agricultural activity, low Dissolved Oxygen and poor biological community scoring, all identified during the 1999 sampling effort, factored into

[1] Personal Communication from Stacey Sobat, Biologist, IDEM, February 6, 2003.

the decision to select Williams Ditch for a more detailed assessment during the summer of 2000. A study design was formulated to determine the actual Dissolved Oxygen levels existent during low flow warm weather months (IDEM 2000b). The study design also included elements to determine the physical and chemical characteristics of Williams Ditch and sources which may be contributing to low Dissolved Oxygen levels and impaired aquatic life.

Materials and Methods

Sampling time frame, weather conditions, flow stage, and an adequate stream reach assessment are all critical components of a successful water quality study. The Williams Ditch study was conducted on August 23rd and 24th of 2000. Weather conditions were very clear and sunny with ambient mid-day air temperatures ranging from 76 to 85 degrees Fahrenheit. Water conditions were relatively stable with no precipitation events occurring in the days immediately preceding the sampling event. The stream reach extended from .76 miles upstream to 2.0 miles downstream of the 1999 probabilistic site of UMK110-0008 (L134035)[1] near 125th Avenue (Latitude 41° 10' 13.66", Longitude 87° 23' 40.80"). The total stream reach length for this study was 2.76 miles.

Sample Locations

A total of three targeted sampling locations were chosen for this study and are shown in Figure 1. One site is situated upstream and two sites are situated downstream of the 1999 probabilistic site. Site locations were determined by upstream and downstream proximity to the 1999 site and site accessibility as provided by local roads and bridges. Detailed descriptions of sampling locations are listed in Table 1.

Table 1 Site Location Descriptions

Site ID	Stream	Location	Latitude/Longitude
UMK110-0004	Williams Ditch	South end of Whitcomb St.	41° 10' 25"/87° 22' 54"
UMK120-0005	Williams Ditch	King Drive	41° 09' 54"/87° 24' 25"
UMK120-0006	Williams Ditch	D/S Bridge from King Drive	41° 10' 22"/87° 25' 45"

Physical Characteristics

Physical stream measurements were also an important component towards evaluating stream conditions in Williams Ditch. Flow measurements and gradient calculations in addition to physical stream descriptions were collected to further evaluate the source of impaired conditions. Velocity measurements in particular are critical in lending evidence of stagnant conditions (see page 5).

Chemical Measurements

Type of samples and parameters collected were also critical to accurately characterize the diurnal fluctuations of water chemistry in Williams Ditch. Water chemistry sampling was divided evenly over a twenty-four hour period and collected as three part composites at all sampling locations. Field data were collected at each sampling visit using a Hydrolab multiparameter sampling device. Although continuous monitoring is sometimes required to characterize diurnal

[1] NOTE: This site was labeled as UMK110-0003 in the 1999 Probabilistic Study.

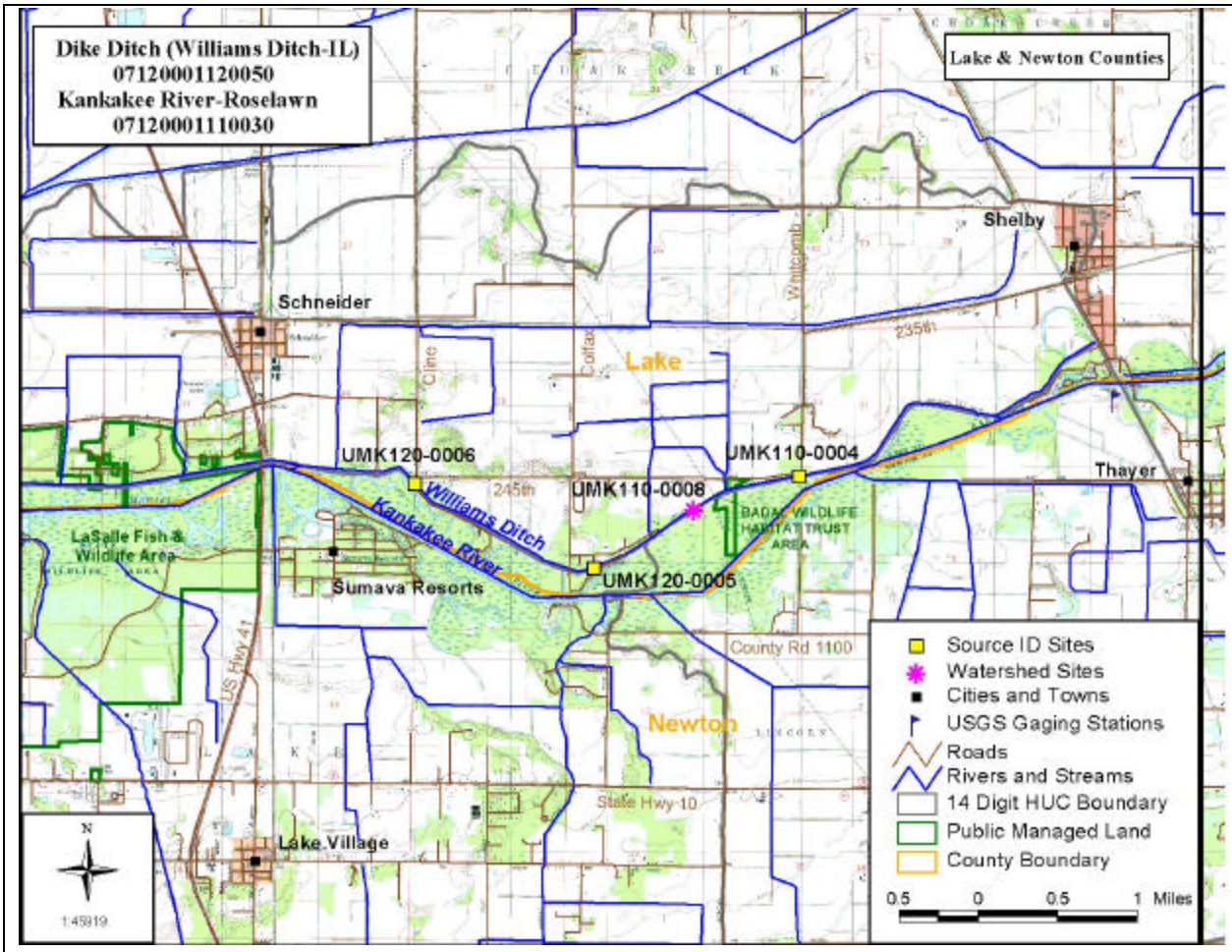

Figure 1 Williams Ditch Study Area

fluctuations in water chemistry in streams, the data collected by the Hydrolab proved sufficient to evaluate the Dissolved Oxygen levels in Williams Ditch. Sampling times were scheduled for morning and late afternoon of the first day and early morning of the following day. Field and laboratory parameters collected are presented in Tables 2 and 3.

Table 2 Field Parameters

Parameter	Method	Limits of Quantitation
Dissolved Oxygen	SM 4500-OG	0.03 mg/L
Turbidity	SM 2130	0.3 NTU
Specific Conductance	SM 2510	3 umhos/cm
Temperature	SM 2550	-5^{o} Celsius
pH	SM 4500-H	+/-0.01 SU

Table 3 Chemical Parameters for Laboratory Analyses

Anions/Physical			Nutrients/Organic		
Parameter	Method	CRQL	Parameter	Method	CRQL
Alkalinity	310.1	10 mg/L	TKN	351.2	.05 mg/L
$CBOD_5$	405.1	2.0 mg/L	Ammonia-N	350.1	.01 mg/L
Total Solids	160.3	1.0 mg/L	Nitrate+Nitrite-N	353.2	.01 mg/L
Suspended Solids	160.2	4.0 mg/L	Total Phosphorus	356.2	1.0 mg/L
Dissolved Solids	160.1	1.0 mg/L	TOC	415.1	1.0 mg/L
Sulfate	375.2	1.0 mg/L	COD	410.4	3.0 mg/L
Chloride	325.2	1.0 mg/L			
Hardness	130.1	1.0 mg/L			

Quality Assurance

Contracting laboratories provide analytical reports to IDEM that contain test results and Quality Control information for each batch of samples. Quality assurance and quality control (QA/QC) procedures for this study adhered to the Quality Assurance Project Plan (QAPP), and all field and laboratory data collected for this study met QA/QC requirements for Indiana Surface Water Quality Monitoring Programs of the Assessment Branch (IDEM 1999). See Attachment II for a complete copy of the QA/QC report. Generally, this plan requires one duplicate and one matrix spike/matrix spike duplicate (MS/MSD) for every ten samples collected in addition to one blank sample for every field trip. The Williams Ditch study only required three stream samples so that one duplicate, one MS/MSD, and one blank adequately satisfied QA/QC requirements. Stream samples and field data are also required to meet Data Quality Assessment levels cited in the QAPP for Indiana Surface Water Quality Programs. Data Quality Assessment Levels are explained in Attachment II.

Sampling was conducted according to Standard Operating Procedures (IDEM 2002c).

Results

Physical Observations

Williams Ditch is a channelized ditch running parallel to the Kankakee River and serves as a lateral for channelized agricultural feeder ditches. At the time of the study, the riparian zone was characterized by steep, leveed banks which varied from grassy and weedy at the upstream site, UMK110-0004, to predominantly wooded at the first downstream site, UMK120-0005, to trees overhanging the stream at the last downstream site, UMK120-0006. Shading estimates were 0%, 75%, and 85% for the upstream to downstream sites respectively. Just beyond the immediate riparian zones was intensive agricultural activity to the north with buffer strips being very narrow (less than ten meters) along most of the study reach. The water column was pooled and similar to a continuous elongated pond for the length of the study reach. The water was very greenish and turbid with various types of algae nearly choking the stream at all sampling locations. Aquatic plants were particularly evident at the 2nd and 3rd sampling locations with lily pads being prevalent at the 2nd sampling site. Duckweed covered nearly the entire stream at the 3rd sampling site. The bottom substrate consisted of heavy silt and muck at all three sampling locations. The sediment was black and odorous from what appeared to be vegetative decay. A creosote sheen was observed leaching from new bridge timbers at the last downstream sampling location. None of these conditions are conducive to a healthy and well balanced aquatic life community.

Flow Characteristics

Physical characteristics, both natural and anthropogenic were found to be contributing to the stagnant and algae choked conditions in Williams Ditch. Topography in this area is generally very flat with the streams having minimal gradient. The calculated gradient for the Williams Ditch study reach is 0.7 feet/mile, which is considerably less than the 6-7 feet/mile average for all streams in Indiana.[2] The exceptionally low gradient rendered barely detectable flows according to velocities measured at each of the sampling sites. A complete set of flow measurements were not achieved due to the thick algae, deep muck and deep pooled conditions. Three velocity measurements were determined, with difficulty, at UMK120-0005, the second downstream site. From the north to south bank at roughly equal intervals, velocities of 0.02, 0.03, and 0.0 ft/sec were obtained. Velocities at this minute level are indicative of a stream barely moving, if at all.

In an effort to further evaluate stream conditions, a portion of the stream reach from the second downstream site to the third downstream site was walked during the course of the study. Williams Ditch was found to have a small impoundment downstream of the second sampling site. The impoundment was obviously serving the purpose of irrigation for the adjacent cropland. Irrigation equipment was in place and had been operating recently. The stream was observed to have very little flow downstream of the impoundment and appeared nearly dry at one point. The impoundment was further exacerbating stagnant conditions already present from the low gradient features of the stream.

Dissolved Oxygen

Analysis of laboratory and field data, presented in Tables 4 and 5, indicate that Dissolved Oxygen levels in Williams Ditch ranged below State Standards for this source identification study. Analyzing the data from upstream to downstream, the most upstream site of UMK110-0004 did not show D.O stream standard violations for any of the three sampling collection times during the twenty-four hour study period. The average Dissolved Oxygen for this site was 7.47 mg/L. This site was completely exposed to sunlight so that photosynthetic activity was most definitely a factor in the Dissolved Oxygen levels observed. There was a marked diurnal variation from the afternoon, August 23, 2000 1:30 PM, where Dissolved Oxygen was measured at 9.56 mg/L, to early morning of the following day, August 24, 8:45 AM, when a Dissolved Oxygen of 5.2 mg/L was recorded. Although there were no Dissolved Oxygen violations observed at this site, the pattern of fluctuation gives a strong indication that nighttime Dissolved Oxygen levels would have been below the stream standard. The second and third downstream sites, UMK120-0005 and UMK120-0006, respectively, not only showed one time Dissolved Oxygen levels below 4.0 mg/L, but both sites averaged below the 5.0 mg/L stream standard for a twenty-four period. The high Dissolved Oxygen readings for each site occurred during the afternoon sample collection times when sunlight penetration to the stream and photosynthetic activity were at the highest levels. Dissolved Oxygen levels during these collection times were 4.96 mg/L and 6.13 mg/L for UMK120-0005 and UMK120-0006 respectively. The lowest Dissolved Oxygen levels for each site occurred during the early morning sampling collection times on August 24th. Levels observed were 3.84 mg/L and 3.06 mg/L for UMK120-0005 and UMK120-0006 respectively. The average Dissolved Oxygen for UMK120-0005 was 4.41 mg/L

[2] Personal Communication from James Connon, Environmental Scientist/OWQ Modeling Section, IDEM, (June 2000)

and 4.53 mg/L for UMK120-0006. Negative impact on aquatic life could certainly occur at the Dissolved Oxygen levels observed for this study and it is likely diurnal nighttime Dissolved Oxygen levels dropped further.

Chemical Parameters

Stream standards calculations were completed on all other parameters collected for this study (Table 4). Other than Dissolved Oxygen (Table 5), no other stream standard violations were found. Of particular concern was Ammonia and Nitrate+Nitrite data that did not indicate any levels near stream standard violations. It should be noted that chemical parameters were measured in August and would have been well removed from the heavy fertilizer application period that occurs in the spring.

Table 4 Laboratory Results From Composite Samples

	Sampling Sites		
Parameter	**UMK110-0004**	**UMK120-0005**	**UMK120-0006**
Alkalinity – mg/L	160	210	210
COD – mg/L	19	17	27
Chloride – mg/L	24	49	22
Hardness – mg/L	240	140	180
TKN – mg/L	0.75	0.92	1.2
Ammonia – mg/L	0.2	0.28	0.47
Nitrogen, NO_3+NO_2 – mg/L	<.01	0.034	0.25
Phosphorus – mg/L	0.043	0.076	0.18
Total Solids – mg/L	400	610	600
Total Dissolved Solids – mg/L	370	480	550
Suspended Solids – mg/L	6	<4	<4
Sulfate – mg/L	83	77	67
TOC – mg/L	6.6	7.5	7.3

Table 5 Field Sampling Results

Site	Date	Time	Dissolved Oxygen mg/L	pH SU	Temp. °C	Spec. Con. umhos/cm	Turbidity NTU
UMK110-0004	8/23/00	9:45 AM	7.64	7.9	23.77	536	8.3
UMK110-0004	8/23/00	1:30 PM	9.56	8.3	28.24	521	4.4
UMK110-0004	8/24/00	8:45 AM	5.2	7.7	23.41	549	51
UMK120-0005	8/23/00	10:30AM	4.44	7.8	22.66	623	24.8
UMK120-0005	8/23/00	1:55 PM	4.96	7.8	24.57	621	5.6
UMK120-0005	8/24/00	9:10 AM	3.84	7.8	21.76	620	8.5
UMK120-0006	8/23/00	11:10 AM	4.4	7.6	22.77	586	11.4
UMK120-0006	8/23/00	2:15 PM	6.13	7.7	25.78	577	28.7
UMK120-0006	8/24/00	9:25 AM	3.06	7.5	21.32	603	13.3

Discussion

In Williams Ditch a number of conditions were present which contributed to the depressed Dissolved Oxygen levels and resultant impaired biotic communities. Williams Ditch and the network of channelized ditches in the Kankakee River Basin generally serve a twofold purpose. Historically, these manmade ditches function as a drainage system for wetlands in the area to facilitate agricultural activities. Conversely, during dry weather periods, water from the ditches can be used for cropland irrigation purposes. The lack of adequate buffer strips along the north bank of Williams Ditch allow for relatively unimpeded runoff of chemical applications in the spring months. Fertilization runoff promotes an ideal setting for algae proliferation in the static low gradient conditions present in Williams Ditch. Impoundment only serves to further slow down the stream and stifle any possibility of reaeration in the study reach. The algae choked conditions account for diurnal fluctuations in the sunny exposed reaches and depressed Dissolved Oxygen levels in the shaded riparian zone reaches. In those areas where duckweed had recently smothered the stream surface, the underlying algae was in the process of dying off thereby causing an additional oxygen demand. Additionally, the nature of the mucky putrescent sediment was likely causing a sediment oxygen demand as well.

Natural and long existing manmade conditions on Williams Ditch would make improvement of the low Dissolved Oxygen levels, poor habitat, and impaired aquatic life difficult. The flat topography and low gradient are natural conditions that would be impractical to change. Channelization and impoundments have been widely accepted practices in the Kankakee River Basin since the draining of the Grand Kankakee Marsh and the beginning of the Kankakee River channelization project in 1896 (IDNR 1990). Dramatic changes in property ownership and adjacent agricultural practices will have to occur in order for Williams Ditch to be turned into a more natural meandering free flowing state. These changes, however, are not a guarantee that Williams Ditch would be a highly oxygenated stream and support a well balanced fish community. Natural conditions such as low stream gradient would still exist. One viable option which may at least in part alleviate the proliferation of algae growth in Williams Ditch, would be implementation of Best Management Practices (BMP) for impeding nutrient runoff from rowcrop activity.

Summary and Conclusions

For 305(b) Water Quality assessment and reporting purposes, causes and sources were determined and are listed in Tables 6 and 7 (IDEM 2002).

Table 6 Identified Causes for 305(b) Report and 303(d) Impairment Listings

Cause Code	Cause Name	Definition
900	Nutrients	Inorganic nutrients are driving physical/chemical stream imbalance
1100	Siltation	Imbeddedness and smothering of substrate
1200	Organic enrichment/ Low Dissolved Oxygen	Major category included with organic enrichment and low Dissolved Oxygen
1500	Flow Alteration	Addition or subtraction of discharge, change in velocity
1600	Other habitat alterations	Response to land use practice such as dredging or channelization
2210	Algal Growth/Chlorophyll a	Overgrowth of algae observed

Table 7 Identified Sources for 305(b) Report and 303(d) Impairment Listing

Source Code	Source Name	Definition
1050	Crop related Sources	Land use is row crops
7100	Channelization	Straightening channel
7350	Impoundment	Not used
7600	Removal of Riparian Vegetation	Bushes, trees removed; row crops to bank edge
7800	Drainage/Filling of Wetlands	Not used

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Attachment I

Indiana Department of Environmental Management

Office of Water Quality/ Assessment Branch/ Biological Studies Section

Fish Community Assessments

Site Information

SubBasin: Kankakee **14 digit HUC:** 07120001110030 **LSite:** UMK110-0008

Site: Williams Ditch **Location:** 125th Ave **County:** Lake

Latitude: 41 10 13.664 **Longitude:** -87 23 40.795 **IASNatRegion:** 3C **Topo:** B-25 **Segment:** 14

Ecoregion: Central Corn Belt Plains **DrainageArea (sq.miles):** 11 **Gradient (ft/mile):** 0.6

Sample Information

SampleNumber: DA13583 **EventID:** 99035 **SampleMediumCollected:** Water + FishComm + FishTiss

SampleDate: 7/14/99 9:30: **SurveyCrewChief:** ARB **SampleTime:** 9:30:00 AM **HydroLabNumber:** BS3

WaterFlowType: **WaterAppearance:** **SkyConditions:** Scattered **AirTemperature:** 76-85

WindDirection: West (270 degrees) **WindStrength:** Calm

DissolvedO2 (mg/l): 1.27 **pH:** 7.2 **WaterTemp (°C):** 17.8 **SpecificConductivity (µS/cm):** 637 **Turbidity (NTU):** 23.6

SpecialNotes:

ElectrofishingEquipment: Scanoe **Voltage:** 300 **Avg.StreamWidth (m):** 9.4 **DistanceFished (m):** 135

SecondsFished: 1400 **WaterDepthAvg (m):** 1.2 **WaterDepthMax (m):** 2 **TimeAtSite:** 3:30

BridgeInReach: ☐ **ReachRepresentative:** ☑ **WhyReachNotRepresentative:**

SpecialComments:

Habitat Information

TotalScore (max100): 33 **SubstrateScore (max20):** 0 **InstreamCoverScore (max20):** 12 **ChannelMorphologyScore (max20):** 4

RiparianZoneBankErosionScore(max10): 7 **Pool/GlideQualityScore (max12):** 8 **Riffle/RunScoreQuality (max8):** 0

GradientScore (max10): 2 **%Pool** 0 **%Riffle:** 0 **%Run:** 100 **%Glide:** 0 **CanopyCoverPctOpen:** 85

SubjectiveRating: 3 **AestheticRating:** 2 **NOTES:**

Fish Community Index of Biotic Integrity (IBI) Information

	Actual Observation	Metric Score		Actual Observation	Metric Score
SpeciesCount:	11	5	SensitiveSpeciesCount:	1	1
Darter/Madtom/SculpinSpeciesCount:	0	1	%TolerantIndividuals:	6.0	5
DarterSpeciesCount:	0		%OmnivoreIndividuals:	4.0	5
%LargeRiverIndividuals:			%InsectivoreIndividuals:	86.0	5
%HeadwaterIndividuals:	0.0	1	%PioneerIndividuals:	0.0	5
SunfishSpeciesCount:	3		%CarnivoreIndividuals:	10.0	
CentrarchidaeSpeciesCount:			Total #of Individuals(CPUE):	50	1
MinnowSpeciesCount:	1	1	CPUElessGizzardShads:		
SuckerSpeciesCount:	2		%SimpleLithophilicInd.:	6.0	1
RoundBodySuckerSpeciesCount:			%Ind.withDeformities,	6.0	1
SalmonidaeSpeciesCount:			ErodedFins,Lesions,Tumors:		

Metrics are dependent on Ecoregion and Drainage Area.
Metrics can score a 1, 3, or 5 depending on calibration.

TotalIBIScore (min 6=nofish): 32 max=60

Indiana Department of Environmental Management
Office of Water Quality/ Assessment Branch/ Biological Studies Section
Fish Community Assessments

SampleNumber: DA13583 **EventID:** 99035 **LSite:** UMK110-0008 **County:** Lake
StreamName: Williams Ditch **LocationDescription:** 125th Ave

Common Name	Individual Fish Count	Deformities	Eroded Fins	Lesions	Tumors	Multiple Anomalies
Black Bullhead	1	0	1	0	0	0
Blackstripe Topminnow	4	0	0	0	0	0
Bluegill	33	0	0	0	0	0
Common Carp	1	0	0	0	0	0
Largemouth Bass	3	0	0	0	0	0
Longear Sunfish	1	0	0	0	0	0
Pumpkinseed	1	0	0	0	0	0
Spotted Sucker	2	0	2	0	0	0
Warmouth	2	0	0	0	0	0
Western Mosquitofish	1	0	0	0	0	0
White Sucker	1	0	0	0	0	0

Attachment II
Quality Assurance of Analytical Data for Water Samples from the Source Identification
Sampling Dates: 8/23/2000

Environmental Toxicology and Chemistry Section, AB/OWM
QA/QC Review Report: IDEM/100/29/477/058/2000

IDEM Sample Set # 00WQW221
Sample Identification and Sampling Locations

	SampleID	TA Sample No.	Sample Type	Date Sampled	Site Name	River/Stream/Creek/Lake	Sample Location	County
1	AA01748	273726	MS/MSD	8/23/00	UMK110-0004	Williams Ditch	South end of Whitcomb St.	Lake
2	AA01749	273727	Field Blank	8/23/00	BLANK		Dummy Site for Blanks	
3	AA01750	273728	Normal	8/23/00	UMK120-0005	Williams Ditch	King Drive	Lake
4	AA01751	273729	Normal	8/23/00	UMK120-0006	Williams Ditch	D/S Bridge from King Drive	Lake
5	AA01752	273730	Duplicate	8/23/00	UMK120-0006	Williams Ditch	D/S Bridge from King Drive	Lake

Testing Laboratory:

Test America Incorporated (TA)
Indianapolis Division
6964 Hillsdale Ct.
Indianapolis, IN 46250

Contact Person:
Ž Ron Barnett
Ž Telephone: 317-842-4261

Sample Receipt Date to TA: 8/24/2000
TA Job Number (s): 00.04551

Date Report Prepared: 9/28/2000
Date Report Received: 10/12/2000

Chain of Custody: A check mark (**U**) below indicates information about each item is complete and acceptable.

Ž Sampler Signature **U**
Ž Custodian Signature **U**
Ž Collection Time(s) **U**
Ž Collection Date(s) **U**
Ž Receiving Time(s) **U**
Ž Receiving Date(s) **U**
Ž Preservatives **U**
Ž Containers **U**

General Chemistries

Test Methods and Reporting Limits (mg/L unless otherwise noted)

PARAMETERS:	TEST METHODS	IDEM REPORTING LIMITS	TA REPORTING LIMITS
Alkalinity	310.1	10	10
Chloride	325.2	1.0	1.0
Chemical Oxygen Demand (COD)	410.4	3.0	5.0
Cyanide (Total)	335.3	0.005	0.005
Hardness (as $CaCO_3$)	130.1	1.0	1.0
Nitrogen, Ammonia	350.1	0.01	0.10
Nitrogen, Total Kjeldahl (TKN)	351.2	0.05	0.10
Nitrogen, Nitrate+Nitrite	353.2	0.01	0.01
Phosphorus, Total	365.2	0.01	0.03
Solids, Dissolved (TDS)	160.1	10	10
Solids, Suspended (TSS)	160.2	4.0	4.0
Solids, Total (TS)	160.3	1.0	7.0
Sulfate	375.2	1.0	5.0
Total Organic Carbon (TOC)	415.1	1.0	1.0

Quality Control (QC) Checks and Compliance: A check mark (**U**) below indicates information about each QC criterion is complete and acceptable.

- Ž Summary Data Package **U**
- Ž Prep Dates **U**
- Ž Analysis Dates **U**
- Ž Holding Times **U**
- Ž Approved Analytical Methods **U**
- Ž Approved Detection Limits **U**
- Ž Method, Field, and Trip Blanks (< CRQL or Control Limit) **U**
- Ž Field and Method Duplicates (RPD $\leq$ 20) **U**
- Ž Matrix Spikes and Matrix Spike Duplicates ($\pm$ 20%; RPD $\leq$ 20) **U**
- Ž Instrument Calibrations (Correlation Coefficient $\geq$ 0.995) **U**
- Ž Laboratory Control Standards ($\pm$ 20%) **U**
- Ž Initial and Continuing Calibration Verification Standards ($\pm$ 10%) **U**

Comments: See Below

IDEM ID	Parameter(s)	Data Flag(s)	Action
AA01748, AA01749, AA01750, AA01751, AA01752	Chemical Oxygen Demand (COD) ①	J	Estimated
AA01748	Solids, Suspended (TSS) ②	D J	Estimated
AA01748, AA01750	Nitrogen, Total Kjeldahl (TKN) ③	B J	Estimated
AA01751, AA01752	Nitrogen, Total Kjeldahl (TKN) ④	B	Accepted
AA01751	Chloride ⑤	H J	Estimated
AA01751	Chemical Oxygen Demand (COD) ⑥	H J	Estimated
AA01751, AA01752	Solids, Dissolved (TDS) ⑦	D J	Estimated
AA01751, AA01752	Solids, Suspended (TSS) ⑧	D J	Estimated

Î The MS/MSD recovery values were below the acceptable limits. The matrix interference may be suppressing the analyte recovery. The concentration values for the sample may be biased low due to the suspected matrix interference, therefore set of samples will be considered estimated.

② The RPD between the lab duplicates was above acceptable control range. The RPD was 40%, therefore this will be considered estimated.

③ This parameter was found in field blank at .12 mg/L. Samples between .6 and 1.2 will be estimated.

④ This parameter was found in field blank at .12 mg/L. Samples above 1.2 will be accepted

⑤ The analysis for this parameter was performed 1 day out of the 28 day holding time, therefore the sample will be estimated.

⑥ The analysis for this parameter was performed 7 day out of the 28 day holding time, therefore the sample will be estimated.

⑦ The Relative Present Difference (RPD) between the field duplicates was above acceptable control range. The RPD was 24.5%, therefore this will be considered estimated.

⑧ The RPD between the field duplicates was above acceptable control range. The RPD was 22.2%, therefore this will be considered estimated.

Data Qualifiers and Flags

R: Rejected
J: Estimated.
Q: One or more of the QC checks or criteria was out of control.
H: The analysis for this parameter was performed out of the holding time. The results will be estimated or rejected on the basis listed below:
    1) If the analysis was performed between the holding time and 1½ times the holding time the result will be estimated.
    2) If the analysis was performed outside the 1½ times the holding time window the result will be rejected.
D: The Relative Present Difference (RPD) for this parameter was above the acceptable control limits. The parameter will be considered estimated or rejected on the basis listed below:
    1) If the RPD is between the established control limits and two times the established control limits then the sample will be estimated.
    2) If the RPD is twice the established control limits then the sample will be rejected.
B: This parameter was found in field or lab blank. Whether the result is accepted, estimated, or rejected will be based upon the level of contamination listed below.
    1) If the result of the sample is greater than the reporting limit but less than five times the blank contamination the result will be rejected.
    2) If the result of the sample is between five and ten times the blank contamination the result will be estimated
    3) If the result of the sample is less than the reporting limit or greater than ten times the blank contamination the result will be accepted.
U: The result of the parameter is above the Method Detection Limit (MDL) but below the reporting limit and will be estimated.

Data Quality Assessments (DQAs): A check mark (**U**) below indicates the DQA Level to which the analytical data qualifies.

Level 1 9 **Screening data:** The results are usually generated onsite and have no QC checks. Analytical results, which have no QC checks or no precision or accuracy information or no detection limit calculations, but just numbers, are included in this category. Primarily, onsite data are used for presurveys and for preliminary rapid assessment.

Level 2 9 **Field analysis data:** Data is recorded in the field or laboratory on calibrated or standardized equipment. Field duplicates are measured on a regular periodic basis. Calculations may be done in the field or later at the office. Analytical results, which have limited QC checks, are included in this category. Detection limits and ranges have been set for each analysis. The QC checks information for field or laboratory results is useable for estimating precision, accuracy, and completeness for the project. Data from this category is used independently for rapid assessment and preliminary decisions.

Level 3 [**U**] **Laboratory analytical data:** Analytical results include QC check samples for each batch of samples from which precision, accuracy, and completeness can be determined. Detection limits have been determined using 40 CFR Part 136 Appendix B, Revision 1.11. Raw data, chromatograms, spectrograms, and bench sheets are not included as part of the analytical report, but are maintained by the Contract Laboratory for easy retrieval and review. Data can be elevated from level 3 to level 4 by the inclusion of this information in the report. In addition, level 4 QC data must be reported using CLP forms or CLP format. Data falling under this category is considered as complete and is used for regulatory decisions.

Level 4 **9** **Enforcement data:** Analytical results mostly meet the USEPA required Contract Laboratory Program (CLP) data analysis, contract required quantification limits (CRQL), and validation procedures. QC data is reported on CLP forms or CLP format. Raw data, chromatograms, spectrograms, and bench sheets are included as part of the analytical report. Additionally, all reporting information required in the IDEM/BAA and in the Surface Water QAPP Table 11-1 are included. Data is legally quantitative in value, and is used for regulatory decisions.

Compliance Statement:

The laboratory results for a Data package from **5 water** samples received from Test America (TA) were reviewed for compliance with IDEM BAA 97-44, dated 4/18/97 and OWM QAPP (Rev. 2, June 1999) for Indiana Surface Water Programs.

Summary and Conclusions:

1. Data Quality Assessment Level: 3
2. Level of Completeness: 100%

The data for the **5 water** samples from data package **00WQW221** has been assigned to Data Quality Assessment (DQA) Level 3 of QAPP for Indiana Surface Water Programs. The analytical results for **5 water** samples appear acceptable and could be used for OWM decision making.

Reviewed by:
Signature: ___Tim Bowren ___ Title: Chemist_____ Date: October 13, 2000
Signed original on file
Approved by:
Signature:_Dr. Syed GhiasUddin___Title: QA/Coordinator____Date: _____
Signed original on file

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